

BEET (*Beta vulgaris* subsp. *vulgaris*)  
 WILD BEET (*Beta vulgaris* subsp. *maritima*)  
 Rhizoctonia root rot; *Rhizoctonia solani*

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### **Rhizoctonia root rot resistance of *Beta* PIs from the USDA-ARS NPGS, 2003.**

Thirty-five Plant Introductions (PIs) from the USDA-ARS National Plant Germplasm System (NPGS) (garden beet, sugar beet, leaf beet, fodder beet, and wild beet) were evaluated for resistance to Rhizoctonia root rot. The trial was a randomized, complete-block design. One-row plots, replicated five times were planted at the Crops Research Lab-Fort Collins Research Farm, CO, on 15 May. Plots were 4.5 m long with 56 cm between rows and 20 to 25 cm within-row spacing. Inoculation with dry, ground, barley-grain inoculum (3 g/m) of *Rhizoctonia solani* isolate R-9 (AG-2-2) was performed on 10 Jul. Immediately after inoculation, a cultivation was performed to throw soil into the beet crowns. The field was thinned by hand and irrigated as necessary. Beets were harvested 27 Aug. Each root was rated for rot on a scale of 0 (no damage) to 7 (dead). Analyses of variance (PROC ANOVA - SAS) were performed on disease indices (DI), percent healthy roots (undamaged classes 0 and 1 combined), and percentage of roots in classes 0 thru 3 (those most likely to be harvested and taken to the factory). Percentages were transformed using arcsine-square root to normalize the data for analyses ("AP 0-1" and "AP 0-3" in the accompanying table). Both percentages and transformations are given in the table.

We had high temperatures in the summer of 2003 and a high inoculum load. The Rhizoctonia root rot epidemic progressed quickly, becoming severe by the end of August. Differences in the DI among entries were highly significant ( $P < 0.001$ ). Mean DIs across all tests in the 2003 nursery for highly resistant FC705-1, resistant FC703, and highly susceptible FC901/C817 controls were 3.2, 3.3, and 5.5, respectively. Percentages of healthy roots were 12.2, 8.7, and 1.4% for these controls. Percentages of roots in disease classes 0 thru 3 were 57.4, 50.5, and 7.0%, respectively. The highest and lowest DI for the evaluated lines was 6.9 and 2.9, respectively. The highest and lowest DI for the PI accessions was 6.8 and 3.0, respectively. Seven PIs had DIs that were not significantly different from the resistant control, of which six were not significantly different from the resistant control for percent in classes 0-3 and four were not significantly different in the percent in classes 0-1.

Entry	Seed Source	subspecies	Donor's ID	DI	% 0-1*	% 0-3*	AP 0-1**	AP 0-3**
631	PI 504250	<i>maritima</i>	SD wild beet .....	6.80	0.00	0.00	0.0	0.0
632	PI 504251	<i>maritima</i>	SD wild beet .....	6.75	0.00	3.25	0.0	5.3
633	PI 504266	<i>maritima</i>	SD wild beet .....	5.90	2.00	21.60	3.7	21.3
634	PI 504268	<i>maritima</i>	SD wild beet .....	5.62	0.00	28.00	0.0	25.8
635	PI 504270	<i>maritima</i>	SD wild beet .....	6.54	0.00	8.60	0.0	11.0
636	PI 504271	<i>maritima</i>	SD wild beet .....	6.48	1.60	7.40	3.3	9.8
637	PI 518407	<i>maritima</i>	SD IDBBNR 5901.....	6.05	4.00	12.60	5.3	13.7
638	PI 518429	<i>maritima</i>	SD IDBBNR 5923.....	6.54	0.00	4.20	0.0	5.5
639	PI 518432	<i>maritima</i>	SD IDBBNR 5926.....	6.60	0.00	0.00	0.0	0.0
640	PI 518437	<i>maritima</i>	SD IDBBNR 5931.....	6.56	0.00	0.00	0.0	0.0
641	PI 518438	<i>maritima</i>	SD IDBBNR 5932.....	6.19	0.00	7.60	0.0	10.2
642	PI 518439	<i>maritima</i>	SD IDBBNR 5933.....	6.11	0.00	8.00	0.0	7.9
643	PI 546511	<i>maritima</i>	SD IDBBNR 9678.....	6.92	0.00	1.60	0.0	3.3
644	PI 546521	<i>maritima</i>	SD IDBBNR 9688.....	6.27	0.00	13.80	0.0	16.6
645	PI 546526	<i>maritima</i>	SD IDBBNR 9693.....	5.63	0.00	25.20	0.0	29.6
646	PI 546529	<i>maritima</i>	SD IDBBNR 9696.....	6.53	0.00	3.60	0.0	5.0
647	PI 546534	<i>maritima</i>	SD IDBBNR 9701.....	6.64	0.00	3.20	0.0	6.5
648	PI 546537	<i>vulgaris</i>	SD IDBBNR 9704.....	6.38	0.00	5.20	0.0	8.3
649	PI 546538	<i>vulgaris</i>	SD IDBBNR 9705.....	5.79	1.80	8.80	3.5	10.7
650	PI 552532	<i>vulgaris</i>	SD 'F1012' .....	6.05	0.00	4.00	0.0	7.3
652	PI 558514	<i>vulgaris</i>	SD FC 402 .....	6.11	0.00	0.00	0.0	0.0
653	PI 558515	<i>vulgaris</i>	SD FC 403 .....	5.20	0.00	9.80	0.0	11.8
654	PI 558513	<i>vulgaris</i>	SD FC 401 .....	5.63	0.00	0.00	0.0	0.0
655	PI 285592	<i>vulgaris</i>	SD Crassa Strzelecki I .....	5.01	2.80	19.40	4.4	20.7
656	PI 285593	<i>vulgaris</i>	SD Crassa Udycki Zolty .....	3.79	0.00	45.80	0.0	42.0
657	PI 285594	<i>vulgaris</i>	SD Crassa Walcowaty .....	4.08	0.00	42.60	0.0	37.6
658	PI 285595	<i>vulgaris</i>	SD Crassa Walcowaty .....	3.92	2.60	31.20	4.2	30.7
659	PI 293419	<i>vulgaris</i>	SD Podzimniaja 0474 .....	3.96	10.00	39.40	12.0	38.3
660	PI 293420	<i>vulgaris</i>	SD Bordo 237 .....	3.94	6.20	38.80	9.2	35.2
661	PI 357357	<i>vulgaris</i>	SD Okrugla .....	3.82	2.60	48.60	4.2	43.3
662	PI 357360	<i>vulgaris</i>	SD Ohdiska Zolta .....	3.49	8.00	50.20	10.6	45.1
663	PI 357361	<i>vulgaris</i>	SD Gostivarska Zelena .....	4.40	4.00	31.00	5.3	33.0
664	PI 531260	<i>vulgaris</i>	SD Bordo .....	3.03	13.60	48.00	16.3	40.9
665	PI 535826	<i>vulgaris</i>	SD Gigant Poly .....	4.80	4.00	15.80	5.3	18.2

Entry	Seed Source	subspecies	Donor's ID	DI	% 0-1*	% 0-3*	AP 0-1**	AP 0-3**
666	PI 535845	<i>vulgaris</i>	SD Annmono .....	5.71	0.00	0.00	0.0	0.0
667	931017	<i>vulgaris</i>	<i>Susceptible Check – (FC901/C817)//413.</i>	4.99	0.00	13.00	0.0	18.7
668	831083	<i>vulgaris</i>	<i>FC705/1 - 'Highly Resistant Check .....</i>	2.97	9.60	71.40	13.9	63.8
669	991017	<i>vulgaris</i>	<i>FC703 - 'Resistant Check.....</i>	2.99	13.80	67.40	19.6	56.3
			LSD ( $P=0.05$ ) .....	1.0			9.5	18.9
			Trial Mean .....	5.36	2.30	19.64	3.2	19.5

\* DI = Disease Index on a scale of 0 (no damage) to 7 (plant death), % 0-1= percent healthy roots, % 0-3 those roots most likely to be harvested and taken to the factory.

\*\* AP is the arcsine-square root transformation of percentages to normalize the data for analyses.